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DNA-STR COMPREHENSIVE REPORT

I. Case Information

Laboratory Number: 13-08140 Watertown

Incident Number: 2013-110-0147

Report To: Trooper Michael Cashman, MSP Middlesex County Detective Unit

cc: ADA Adrienne Lynch, Middlesex County District Attorney's Office

Susan Ledoux, Middlesex County District Attorney's Office

Case Type: Fatal Investigation

Date of Incident: 4/18/2013

Victims: Richard Donohue, Jr.

Sean Collier

Dun Meng

Suspects: Dzhokhar Tsarnaev

Tamerlan A. Tsarnaev

II. Results

STR (Short Tandem Repeat) Data

The DNA samples were extracted and amplified using Applied Biosystems AmpFISTR Profiler Plus™, COfiler™ and/or Identifier™ kits and electrophoresed on an ABI 310 or ABI 3130xl genetic analyzer for STR fragment analysis. Profiler Plus™ and COfiler™ kits are utilized to profile 13 genetic loci plus Amelogenin (sex indicator). The AmpFISTR Identifier™ kit is utilized to profile 15 genetic loci plus Amelogenin (sex indicator). The genetic loci for the kits are outlined in the results tables.

MSPCL Lab Number: 13-07864 Boston
 MSPCL Batch Number: MEX2013-0050
 Batch File Reviewer: KAB2

MSPCL Analyst: Jennifer S. Montgomery

Date: April 22, 2013

Identifiler™ Results Table

Exemplar Sample: Allele Types in Repeat Units

Sample Description	Case # Item #	D8S1179	D21S11	D7S820	CSF1PO	D3S1358	TH01	D13S317	D16S539	D2S1338
KSS-Tamerlan A. Tsarnaev	13-07864 15-1.1	13 15	50 31.2	10 12	10 11	14 16	6 6	10 11	10 11	17 24

Sample Description	Case # Item #	D19S433	VWA	TPOX	D18S51	AMEL	D5S818	FGA
KSS-Tamerlan A. Tsarnaev	13-07864 15-1.1	14 15	17 18	8 12	14 17	X Y	11 13	21 24

Key: KSS = Known Saliva Standard

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MSPCL Lab Number: 13-08091 Cambridge
 MSPCL Batch Number: MEX2013-0051
 Patch File Reviewer: KAB2

MSPCL Analyst: Jennifer S. Montgomery

Date: April 26, 2013

Identifier: Results Table

Exemplar Samples: Allele Types in Repeat Units

Sample Description	Case # Item #	D8S1179	D21S11	D7S820	CSF1PO	D3S1358	TH01	D13S317	D16S539	D2S1338
HHS- Sean Collier	13-08091 10-4.1	13	29	8	12	15	6	8	11	19
KBS- Dzhokhar Tsarnaev	13-08091 12-1.1.1	13	31.2	10	11	14	8	8	10	17

Sample Description	Case # Item #	D19S433	VWA	TPOX	D18S51	AMEL	D5S818	FGA
HHS- Sean Collier	13-08091 10-4.1	14	15	10	15	X	12	20
KBS- Dzhokhar Tsarnaev	13-08091 12-1.1.1	12	17	8	14	X	11	21

Key: HHS = Head Hair Standard

KBS = Known Blood Standard

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Identifiler™ Results Table
Questioned Samples: Allele Types in Repeat Units

Sample Description	Case # Item #	D8S1179	D21S11	D7S820	CSF1PO	D3S1358	TH01	D13S317	D16S539	D2S1338
Swab of red-brown stains on exterior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.1.1	13 14	29 32.2	8 9	8 12	15 20	6 7	8 12	11 12	19 24
Swab of red-brown stains on exterior dorsal side of pinky of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.3.1	13 14	29 32.2	8 9	8 12	15 20	6 7	8 12	11 12	19 24

Sample Description	Case # Item #	D19S433	vWA	TPOX	D18S51	AMEL	D5S818	FGA
Swab of red-brown stains on exterior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.1.1	14 15	15 17	10 11	15 20	X Y	12 12	20 22
Swab of red-brown stains on exterior dorsal side of pinky of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.3.1	14 15	15 17	10 11	15 20	X Y	12 12	20 22

KEY: **FGA**, large font = major allele(s) / smaller font = minor allele(s)

Identifiler™ Results Table
Questioned Samples: Allele Types in Repeat Units

Sample Description	Case # Item #	D8S1179	D21S11	D7S820	CSF1PO	D3S1358	TH01	D13S317	D16S539	D2S1338
Swab/scrapings of interior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.5.1	* 12 13 14 15	* 30 31 31.2 *	* 9 10 * 12	* 10 11 12 13	14 15 16	6 7 8 9 9.3	8 10 11 12	* 10 11 12 *	17 19 * 24
Swab/scrapings of interior palmar side of thumb, index, middle, and ring fingers of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.6.1	12 13 15	29 30 31 31.2 *	8 10 12	* 10 11 12 13	14 16 Ψ	6 7 * 9	* 10 11 12	10 11 * 13	17 19 24

Sample Description	Case # Item #	D19S433	vWA	TPOX	D18S51	AMEL	D5S318	FGA
Swab/scrapings of interior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.5.1	* 14 15	14 16 17 18	8 *	14 15 * * 19 *	X Y	11 12 13	19 * 21 * 24
Swab/scrapings of interior palmar side of thumb, index, middle, and ring fingers of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7)	13-08140 12-9.6.1	* 14 15	14 16 17 18	8 * 12	14 * 17 *	X Y	11 12 13	19 21 * 24

KEY: Ψ = potential allele below threshold **BOLD**, large font = major allele(s) / smaller font = minor allele(s)

Ψ = peak cannot be differentiated from artifact

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III. Conclusions

1. Swab of red-brown stains on exterior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.1.1:

The DNA profile obtained from this item matched the DNA profile from Sean Collier, and did not match the DNA profiles from Tamerlan A. Tsarnaev and Dzhokhar Tsarnaev.

On the basis of the above results, the following conclusions may be drawn:

- A. Sean Collier (Case # 13-08091, Item # 10-4.1) could have been the source of the male DNA identified on this item. Results were obtained for the genetic loci D8S1179, D21S11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. (Note: Amelogenin, D2S1338 and D19S433 are not utilized in the statistical calculation of probability.) The probability of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is approximately:

Population		
Caucasian	1 in 1,668,000,000,000,000	1 in 1.668 quintillion
African American	1 in 121,000,000,000,000	1 in 121.0 quadrillion
Hispanic	1 in 700,800,000,000,000	1 in 700.8 quadrillion
Asian	1 in 5,371,000,000,000,000	1 in 5.371 quintillion

- B. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could not have been the source of the male DNA identified on this item.

2. Swab of red-brown stains on exterior dorsal side of pinky of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.3.1:

The DNA profile obtained from this item indicated the presence of a mixture of DNA from more than one source. The major source of the DNA from this item has been interpreted, and this major male DNA profile matched the DNA profile from Sean Collier. Tamerlan A. Tsarnaev and Dzhokhar Tsarnaev are excluded as the source of the major profile in this DNA mixture.

On the basis of the above results, the following conclusions may be drawn:

- A. Sean Collier (Case # 13-08091, Item # 10-4.1) could have been the source of the major male DNA identified on this item. Results were obtained for the genetic loci D8S1179, D21S11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. (Note: Amelogenin, D2S1338 and D19S433 are not utilized in the statistical calculation of probability.) The probability of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is approximately:

Population		
Caucasian	1 in 1,668,000,000,000,000	1 in 1.668 quintillion
African American	1 in 121,000,000,000,000	1 in 121.0 quadrillion
Hispanic	1 in 700,800,000,000,000	1 in 700.8 quadrillion
Asian	1 in 5,371,000,000,000,000	1 in 5.371 quintillion

- B. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could not have been the source of the major male DNA identified on this item.

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3. Swab/scrapings of interior palmar side of thumb, index, middle, and ring fingers of left glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.6.1:

The DNA profile obtained from this item is a mixture of DNA from at least two individuals. Tamerlan A. Tsarnaev matched the major profile in this DNA mixture. Sean Collier and Dzhokhar Tsarnaev are excluded as the source of the major profile in this DNA mixture. The minor DNA profile obtained from this item yielded inconclusive results for comparison with Sean Collier and Dzhokhar Tsarnaev.

On the basis of the above results, the following conclusions may be drawn:

- A. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) could have been the source of the major male DNA identified on this item. Results were obtained for the genetic loci D8S1179, D21S11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. (Note: Amelogenin, D2S1338 and D19S433 are not utilized in the statistical calculation of probability.) The probability of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is approximately:

Population		
Caucasian	1 in 3,465,000,000,000,000	1 in 3.465 quadrillion
African American	1 in 318,400,000,000,000,000	1 in 318.4 quadrillion
Hispanic	1 in 3,630,000,000,000,000,000	1 in 3.630 quadrillion
Asian	1 in 39,370,000,000,000,000,000	1 in 39.37 quadrillion

- B. Sean Collier (Case # 13-08091, Item # 10-4.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could not have been the source of the major male DNA identified on this item.

4. Swab/scrapings of interior palmar side of right glove recovered from driver side front floor area (Honda Civic MA Reg. 116GC7), Item # 12-9.5.1:

The DNA profile obtained from this item is a mixture of DNA from at least three individuals. Tamerlan A. Tsarnaev and Dzhokhar Tsarnaev are included as potential contributors in this DNA mixture. The DNA profile obtained from this item yielded inconclusive results for comparison with Sean Collier.

On the basis of the above results, the following conclusions may be drawn:

- A. Tamerlan A. Tsarnaev (Case # 13-07864, Item # 15-1.1) and Dzhokhar Tsarnaev (Case # 13-08091, Item # 12-1.1.1) could have been potential contributors of the DNA identified on this item.

IV. Additional Comments

- The probability estimates were calculated using the Federal Bureau of Investigation's published databases:
 - (Budowle B, Moretti TR, Baumstark AL, Defenbaugh DA, Keys KM. Population data on the thirteen CODIS core short tandem repeat loci in African Americans, U.S. Caucasians, Hispanics, Bahamians, Jamaicans, and Trinidadians. J Forensic Sci 1999;44(6):1277-1286). (African American and Caucasian)
 - (Budowle B, Shea B, Niezgoda S, Chakraborty, R. CODIS STR loci data from 41 sample populations. J Forensic Sci 2001;46(3):453-489). (Southeast Hispanic and General Asian)
- Point estimates were calculated using Recommendation 4.1 contained within The Evaluation of Forensic DNA Evidence; National Research Council, 1996. For these calculations, the value of θ is 0.03.
- The questioned DNA profile (Item # 12-9.6.1, major profile) generated in this case will be searched against the Convicted Offender Index and/or uploaded to a searchable DNA profile database (SDIS - State DNA Index).

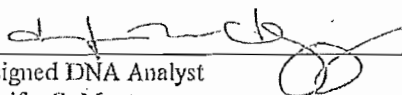
System and NDIS – National DNA Index System). The MSP Crime Laboratory will make contact with the District Attorney's Office and Investigator in the event of a profile match to a database profile.

4. Extraneous DNA may be present on common articles such as clothing, shoes, etc. This extraneous DNA often manifests itself as a low level minor contributor in a DNA result, and may have no probative value in a case. For such samples, only the major contributor may be interpreted.
5. At least 50% of the raw material has been retained for independent analysis, unless the laboratory received written authorization for exhaustive testing. DNA extracts will be retained at the laboratory.
6. Further statistical calculations can be made if necessary and requested.
7. If further analysis is required, please contact the Case Management Unit at (978) 451-3440.

Note: Further comparative analysis requires the submission of the appropriate standards.

V. Signature

This report reflects the test results, conclusions, interpretations, and/or the findings of the analyst as indicated by the signature below.


Assigned DNA Analyst
Jennifer S. Montgomery

4-29-13

Date

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